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HIGHLIGHTED ARTICLES

[Whole-body endothermy in a mesopelagic fish, the opah, *Lampris guttatus*](#)

Science (31.48)

[Fast equatorial waves propagating at the top of the Earth's core](#)

Geophysical Research Letter (4.456)

[Threatened Caribbean coral Is able to mitigate the adverse effects of ocean acidification on calcification by increasing feeding rate](#)

PLOS One (3.534)

[Effects of water supply on labor demand and agricultural production in California's San Joaquin Valley](#)

Water Economics and Policy (N/A)

[Climate change projected effects on coastal foundation communities of the greater Everglades using a 2060 scenario: Need for a new management paradigm](#)

Environmental Management (1.648)

[On the mismatch between salinity tolerance and preference for an invasive fish: a case for incorporating behavioral data into niche modeling](#)

Journal of Experimental Marine Biology and Ecology (2.475)

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[Evaporation from weighing precipitation gauges: Impacts on automated gauge measurements and quality assurance methods](#)

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Advances in Meteorology (1.348)

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Earth Planets Space (3.056)



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OAR Publications

Storm-scale data assimilation and ensemble forecasts for the 27 April 2011 severe weather outbreak in Alabama

Monthly Weather Review (2.76)

Moisture pathways into the U.S. intermountain west associated with heavy winter precipitation events

Journal of Hydrometeorology (3.573)

Modeling the effect of invasive quagga mussels on the spring phytoplankton bloom in Lake Michigan

Journal of Great Lakes Research (1.836)

NMFS Publications

Spatial and isotopic niche partitioning during winter in chinstrap and Adélie penguins from the South Shetland Islands

Ecosphere (2.595)

A high-resolution acoustic imaging system to map interior fish morphology

Marine Technology Society Journal (0.678)

Aquatic animal telemetry: a window into the underwater world

Science (31.48)

Evolution of social capital and economic performance in New England in harvest cooperatives

Marine Resource Economics (1.159)

Coastal upwelling fronts: a key habitat for albacore tuna (*Thunnus alalunga*) in the Northeast Pacific Ocean

Progress in Oceanography (3.986)

Fin whale (*Balaenoptera physalus*) global distribution in the post-whaling era (1980 to 2012)

Mammal Review (3.919)

Modeling larval transport and settlement of pink shrimp in south Florida: Dynamics of behavior and tides



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Marine and Coastal Fisheries Dynamics, Management, and Ecosystem Science (1.810)

[Initiation of migration and movement rates of Atlantic salmon smolts in freshwater](#)

Canadian Journal of Fisheries and Aquatic Science (2.276)

[Fauna crime: elucidating the potential source and introduction history of European smelt \(*Osmerus eperlanus* L.\) into Lake Storsjoen, Norway](#)

Conservation Genetics (1.846)

[Solar zenith angles for biological research and an expected catch model for diel vertical migration patterns that affect stock size estimates for longfin inshore squid, *Doryteuthis pealeii*](#)

Canadian Journal of Fisheries and Aquatic Sciences (2.276)

[Characterizing toxic activity from *Heterosigma akashiwo*: a tale of two assays](#)

Proceedings of the 16th International Conference on Harmful Algae (NA)

NOS Publications

[Identifying historic satio-temporal cyanobacteria biomass in western Lake Erie](#)

Toxins (2.480)

OTHER REPORTS, BOOK CHAPTERS, AND INTERNAL PUBLICATIONS

NMFS

[Correspondence RE: Muñoz et al. Adaptive potential of a Pacific salmon challenged by climate change](#)

Nature Climate Change ()

HIGHLIGHTED ARTICLES

*Whole-body endothermy in a mesopelagic fish, the opah, *Lampris guttatus**
Science (31.48)

N. C. Wegner, O. E. Snodgrass, H. Dewar, J. R. Hyde (NMFS/SWFSC)

- First documentation of a fish with a whole-body form of endothermy, allowing the temperature of vital organs such as the heart to remain above that of the environment.



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- Endothermy should enhance opah physiological performance (e.g., increase muscle power output, enhance temporal resolution and neural conductance for the eye and brain, increase rates of food digestion and assimilation, etc.).
- The discovery provides important insight into the biology (e.g., energetic requirements, habitat usage) of this poorly studied species.

Endothermy (the metabolic production and retention of heat to warm body temperature above ambient) enhances physiological function, and whole-body endothermy generally sets mammals and birds apart from other animals. In this study, the authors describe, however, a whole-body form of endothermy in a fish, the opah (*Lampris guttatus*), which produces heat through the constant “flapping” of wing-like pectoral fins and minimizes heat loss through a series of counter-current heat exchangers within its gills. Unlike other fishes, opah distribute warmed blood throughout the body, including to the heart, thereby enhancing physiological performance and buffering internal organ function while foraging in the cold, nutrient rich waters below the ocean thermocline.

Expected publication date: May or June 2015

Fast equatorial waves propagating at the top of the Earth's core

Geophysical Research Letter (4.456)

A. Chulliat, P. Alken (Cooperative Institute for Research in Environmental Science, University of Colorado Boulder and NOAA National Centers for Environmental Information), and S. Maus

- A new pulse in 2012.5 is discovered. Recent pulses can be decomposed in fast equatorial waves propagating at the core surface. Wave characteristics are consistent to some extent with magnetic Rossby waves in a stratified layer at the top of the core.

Since 2000, magnetic field variations originating in the core have been dominated by several pulses in the secular acceleration, leading to sharp geomagnetic ‘jerks’ at the Earth's surface. Using models built from (i) Defense Meteorological Satellite Program data, (ii) Oersted and Swarm satellites and ground observatory data, we show that a new pulse occurred in 2012.5, immediately following two pulses in 2006 and 2009. The three pulses can be decomposed into several equatorially symmetric modes propagating eastward and westward at 550 to 1100 km/year, and one equatorially anti-symmetric mode propagating eastward at 1650 km/year. The characteristics of these modes are compatible to some extent with equatorial magnetic Rossby waves propagating within a 140 km thick layer at the top of the core with a density contrast of 50 ppm. This interpretation, if confirmed, would provide a new explanation for geomagnetic jerks and pulses based on stable stratification of the core.



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Acceptance date: April 22, 2015

Link to full article: <http://dx.doi.org/10.1002/2015GL064067>

Threatened Caribbean coral is able to mitigate the adverse effects of ocean acidification on calcification by increasing feeding rate

PLOS One (3.534)

E. K. Towle , **I. C. Enochs (CIMAS)**, C. Langdon

- An endangered coral species, staghorn coral, which was once found widely throughout South Florida and the Caribbean, can buffer the effects of increased CO₂ in the ocean by increasing feeding rates

A new study led by University of Miami (UM) Rosenstiel School of Marine and Atmospheric Science researchers and the Cooperative Institute for Marine and Atmospheric Studies (CIMAS) found that the critically endangered Staghorn coral may benefit from supplemental nutrition to mitigate the adverse impacts of global climate change. The results are the first to document that an endangered coral species, which was once found widely throughout South Florida and the Caribbean, can buffer the effects of increased CO₂ in the ocean by increasing feeding rates. Heterotrophy, the ability to obtain required nutrients from the local environment, has been shown to help corals experiencing decreases in growth due to either thermal or ocean acidification stress. This study tested the ability of coral heterotrophy to mitigate reductions in growth due to climate change stress in the critically endangered Caribbean coral *Acropora cervicornis* (staghorn coral) via changes in feeding rate when zooplankton was added to their environment. Only two percent of the Staghorn coral population remains in the Florida Reef Tract, so this resiliency in an endangered species of coral in the face of climate change is a positive find.

Expected publication date: April 2015

Effects of water supply on labor demand and agricultural production in California's San Joaquin Valley

Water Economics and Policy (N/A)

C. Speir (NMFS/SWFSC), **A. Mamula (NMFS/SWFSC)** and D. Ladd

- Estimates economic impacts of water allocation decisions in the Sacramento-San Joaquin River Delta
- Quantifies the uncertainty around such estimates
- Provides a structural model of how various sources of water supply affect agricultural production and how water supply impacts may have changed over time.



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We estimate the effect of changes in water deliveries from large projects on agricultural production. We estimate a region-scale, multi-output production model of the San Joaquin Valley of California using observed historical data.

The model incorporates seven crop outputs and the labor input as functions of project water supply, groundwater pumping price, other surface water sources, wages, and crop prices. We find that: 1) reduced irrigation water supply reduces the demand for farm labor and the production of some crops, 2) regional production mix tends to shift towards cotton when water supply is high, and 3) some structural change has occurred over the course of our 22 year study period, with production of annual crops becoming more sensitive to changes in project water supply and labor becoming less sensitive to local surface water conditions.

Expected publication date: Summer 2015

Climate change projected effects on coastal foundation communities of the greater Everglades using a 2060 scenario: Need for a new management paradigm
Environmental Management (1.648)

M. S. Koch, C. Coronado, **M. W. Miller**, D. T. Rudnick, E. Stabenau, R. B. Halley, F. H. Sklar

- Paper is part of a special issue addressing projected impacts of a specific 2060 climate scenario for various components of the greater Everglades ecosystem
- Significant impacts of warming already evident on coral reefs; sea level rise expected to be greatest impact on mangrove systems; greater uncertainty regarding the impacts on the greater Florida Bay system
- More proactive planning and managing for climate change impacts is needed in broader south Florida ecosystem restoration and coastal management.

Rising sea levels and temperature will be dominant drivers of coastal Everglades' foundation communities (i.e., mangrove forests, seagrass/macroalgae, and coral reefs) by 2060 based on a climate change scenario of 1.5 C temperature, 1.5 foot (46 cm) in sea level, $\pm 10\%$ in precipitation and 490 ppm CO₂. Current mangrove forest soil elevation change in South Florida ranges from 0.9 to 2.5 mm year⁻¹ and would have to increase twofold to fourfold in order to accommodate a 2060 sea level rise rate. No evidence is available to indicate that coastal mangroves from South Florida and the wider Caribbean can keep pace with a rapid rate of sea level rise. Thus, particles and nutrients from destabilized coastlines could be mobilized and impact benthic habitats of southern Florida. Uncertainties in regional geomorphology and coastal current changes under higher sea levels make this prediction tentative without further research. The 2060 higher temperature scenario



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would compromise Florida's coral reefs that are already degraded. We suggest that a new paradigm is needed for resource management under climate change that manages coastlines for resilience to marine transgression and promotes active ecosystem management. In the case of the Everglades, greater freshwater flows could maximize mangrove peat accumulation, stabilize coastlines, and limit saltwater intrusion, while specific coral species may require propagation. Further, we suggest that regional climate drivers and oceanographic processes be incorporated into Everglades and South Florida management plans, as they are likely to impact coastal ecosystems, interior freshwater wetlands and urban coastlines over the next few decades.

Expected publication date: April 2015

On the mismatch between salinity tolerance and preference for an invasive fish: a case for incorporating behavioral data into niche modeling

Journal of Experimental Marine Biology and Ecology (2.475)

J. S. Rehage, D. P. Lopez, M. Y. Anderson and **J. E. Serafy (NMFS-SEFSC)**

- In this study, the salinity preference of the nonnative African jewelfish (*Hemichromis letourneuxi*), a recent and rapidly-expanding invader in the Florida Everglades, was quantified in laboratory trials.
- Study demonstrates importance of considering behavioral preference/avoidance in invasive species research.
- Approach potentially provides more realistic expectation of invasive species spread than those based on their environmental tolerance alone.

Many estuarine species are euryhaline, tolerating a broad range of salinity conditions, such that data on their salinity tolerances can provide little information about a species' distribution and abundance. This is particularly true for nonnative species, known to be tolerant of a broad range of conditions. Instead, data on a species' abiotic or habitat preferences may improve prediction of a nonnative species' potential range, if introduced or if undergoing range expansion. At minimum, information about abiotic preferences may be telling of areas where the probability of nonnative occurrence or density may be higher, and if present, of areas that confer higher fitness. In this study, the salinity preference of the nonnative African jewelfish (*Hemichromis letourneuxi*), a recent and rapidly-expanding invader in the Florida Everglades, was quantified in laboratory trials. Despite the broad salinity tolerance of African jewelfish (up to 50), trials show a strong preference for freshwater conditions. When presented with a salinity gradient, over 50% of observations in timed videotaped trials were collected in the lowest salinity chamber (0.3), suggesting an affinity for low salinity, which was unaffected by the sex or body condition of study fish. Fish clearly avoided mid and



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full salinity conditions. Findings suggest that their distribution may be considerably more limited, and that the species may have higher invasion success in oligohaline habitats, than predicted based on their salinity tolerance. Results have important implications for nonnative species niche modeling, and argue for better integration of behavior along with physiological responses when examining species distributions in dynamic environments.

Accepted: May 2015

ADDITIONAL ARTICLES

NESDIS

Evaporation from weighing precipitation gauges: Impacts on automated gauge measurements and quality assurance methods

Atmospheric Measurement Techniques (3.376)

R. D. Leeper (NCEI) and J. Kochendorfer

- Evaporation from a precipitation gauge can cause errors in the amount of measured precipitation.
- Evaporative losses from auto-recording gauges without evaporative suppressants exceeded accumulated precipitation.
- Results indicate that while climate and gauge design affect gauge evaporation rates, computational methods also influence the magnitude of evaporation biases on precipitation measurements.
- Evaluations of computation algorithms for precipitation, particularly those processing automated weighing-bucket gauges, should include a gauge evaporation assessment.

Evaporation from a precipitation gauge can cause errors in the amount of measured precipitation. For automated weighing-bucket gauges, the World Meteorological Organization (WMO) suggests the use of evaporative suppressants and frequent observations to limit these biases. However, the use of evaporation suppressants is not always feasible due to environmental hazards and the added cost of maintenance, transport, and disposal of the gauge additive. In addition, research has suggested that evaporation prior to precipitation may affect precipitation measurements from auto-recording gauges operating at sub-hourly frequencies. For further evaluation, a field campaign was conducted to monitor evaporation and its impacts on the quality of precipitation measurements from gauges used at U.S. Climate Reference Network (USCRN) stations. Two Geonor gauges were collocated, with one gauge using an evaporative suppressant (referred to as Geonor-NonEvap) and the other with no suppressant (referred to as Geonor-Evap) to evaluate evaporative losses and evaporation biases on precipitation measurements. From June to August, evaporative losses from the Geonor-Evap



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gauge exceeded accumulated precipitation, with an average loss of 0.12 mm/hr. The impact of evaporation on precipitation measurements was sensitive to the choice of calculation method. In general, the pairwise method that utilized a longer time series to smooth out sensor noise was more sensitive to gauge evaporation (-4.6% bias with respect to control) than the weighted-average method that calculated depth change over a smaller window (< +1% bias). These results indicate that while climate and gauge design affect gauge evaporation rates, computational methods also influence the magnitude of evaporation biases on precipitation measurements. This study can be used to advance quality assessment techniques used in other automated networks to mitigate the impact of evaporation biases on precipitation measurements.

Acceptance date: April 28, 2015

Satellite observed aerosol optical thickness and trend around megacities in the coastal zone

Advances in Meteorology (1.348)

X. Zhao (NCDC)

- Continuous global long-term satellite observation of aerosol optical thickness (AOT) is useful for local urban air quality applications.
- Analysis indicates AOT around coastal zone megacities in fast developing countries generally have a positive trend and relatively high AOT value compared to AOT around coastal zone megacities in industrialized countries, which have negative trends.
- Trends in AOT are effective indices for examining the efficacy of air pollution control policies implemented for megacities in the coast zone.

The nearly 30-year aerosol optical thickness (AOT) climate data record (CDR) derived from the operational satellite observations of NOAA Advanced Very High Resolution Radiometer (AVHRR) was used to study AOT trends over seventeen megacities in the coast zone. Linear trends were derived from monthly and seasonal mean AOT and used in the analysis. The results indicated: 1) AOT around a coastal zone megacity in fast developing countries has relatively high value and a positive trend with a confidence level generally above 95%; 2) AOT around a coastal zone megacity in industrialized countries has relatively low value and a negative trend with a confidence level generally above 95%; 3) AOT values and their trends show distinct seasonal variations in coastal zone megacities, which can be somewhat explained by seasonal variations in meteorological conditions. AOT trend is an effective index for examining the efficacy of air pollution control policies implemented for these megacities.

Acceptance date: April 3, 2015



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In-flight performance of the Absolute Scalar Magnetometer vector mode on board the Swarm satellites

Earth Planets Space (3.056)

J. M. Leger, T. Jager, F. Bertrand, G. Hulot, L. Brocco, P. Vigneron, X. Lalanne, A. Chulliat (NESDIS/NCEI)

- An experimental magnetometer providing both scalar and vector measurements of the Earth's magnetic field was successfully tested during the first year of the Swarm satellite mission.
- This instrument could be used in future magnetic satellite missions. It would reduce the payload size and simplify instrument calibration.

The role of the Absolute Scalar Magnetometer (ASM) in the European Space Agency (ESA) Swarm mission is to deliver absolute measurements of the magnetic field's strength for science investigations and in-flight calibration of the Vector Fluxgate Magnetometer (VFM). However, the ASM instrument can also simultaneously deliver vector measurements with no impact on the magnetometer's scalar performance, using a so-called vector mode. This vector mode has been continuously operated since the beginning of the mission, except for short periods of time during commissioning. Since both scalar and vector measurements are perfectly synchronous and spatially coherent, a direct assessment of the ASM vector performance can then be carried out at instrument level without need to correct for the various magnetic perturbations generated by the satellites. After a brief description of the instrument's operating principles, a thorough analysis of the instrument's behavior is presented, as well as a characterization of its environment in flight, using an alternative high sampling rate (burst) scalar mode that could be run a few days during commissioning. The ASM vector calibration process is next detailed, with some emphasis on its sensitivity to operational conditions. Finally the evolution of the instrument's performance during the first year of the mission is presented and discussed in view of the mission's performance requirements for vector measurements.

Accepted: April 15, 2015

OAR Publications

Storm-scale data assimilation and ensemble forecasts for the 27 April 2011 severe weather outbreak in Alabama

Monthly Weather Review (2.76)

N. Yussouf (CIMMS/NSSL), D. Dowell (ESRL), L. Wicker (NSSL), K. Knopfmeier (CIMMS/NSSL), and D. Wheatley (CIMMS/NSSL)



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- The short-range ensemble probabilistic forecasts obtained from this study demonstrate the potential of a frequently-updated, high-resolution NWP systems that could be used to extend severe weather warning lead times (WoF).

As part of the NOAA's Warn-on-Forecast initiative, a multiscale ensemble-based assimilation and prediction system is developed using the WRF-ARW model and DART assimilation software. To evaluate the capabilities of the system, retrospective short-range probabilistic storm-scale (convection-allowing) ensemble analyses and forecasts are produced for the 27 April 2011 Alabama severe weather outbreak. Results indicate that the storm-scale ensembles are able to analyze the observed storms with strong low-level rotation at approximately the correct locations and to retain the supercell structures during the 0-1 h forecasts with reasonable accuracy. The system predicts the low-level mesocyclones of significant isolated tornadic supercells that align well with the locations of radar-derived rotation. For cases with multiple interacting storms in close proximity, the system tends to produce more variability in mesocyclone forecasts from one initialization time to the next until the observations show the dominance of one of the cells. The short-range ensemble probabilistic forecasts obtained from this continuous 5-min storm-scale 6-h long update system demonstrate the potential of a frequently-updated, high-resolution NWP system that could be used to extend severe weather warning lead times. This study also demonstrates the challenges associated with developing a WoF type system. The results motivate future work to reduce model errors associated with storm motion and spurious cells, and to design storm-scale ensembles that better represent typical 1-h forecast errors.

Publication Date: April 7, 2015

Moisture pathways into the U.S. intermountain west associated with heavy winter precipitation events

Journal of Hydrometeorology (3.573)

M. A. Alexander (ESRL/PSD), J. D. Scott, D. Swales, M. Hughes, K. Mahoney, and C. A. Smith

- The Intermountain West (IMW) can sometimes experience winter storms that bring heavy precipitation and lead to severe flooding.
- Researches identified five major pathways that moisture from the Pacific Ocean takes through gaps in the Washington-Oregon Cascade mountains and California's Sierra Nevada and Peninsular mountains, which can lead to extreme precipitation events in parts of the IMW.
- This information can be used to improve short-term forecasts, and to inform decision makers such as water managers and emergency planners.



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The Intermountain West (IMW) is an area spanning much of the western U.S. between the Washington and California mountain ranges to the west, and the Continental Divide to the east. Although typically arid, the IMW can sometimes experience winter storms that bring heavy precipitation and lead to severe flooding. A new study from researchers at ESRL's Physical Sciences Division and the Cooperative Institute for Research in Environmental Sciences (CIRES) finds that when moisture from the Pacific takes certain paths through gaps in the Washington-Oregon Cascade mountains and California's Sierra Nevada and Peninsular mountains (the Peninsulars are mainly in Baja, California, but can still block moisture coming from the southwest), it can lead to extreme events in parts of the IMW. Because floods can damage roads and property, and compromise public travel and safety, tracking how this wintertime moisture travels and builds along these pathways can provide better understanding of the processes generating the heaviest precipitation. This information can be used to improve short-term forecasts, and to inform decision makers such as water managers and emergency planners. Moisture from the Pacific that produces extreme precipitation in the IMW during winter takes dominant pathways that are influenced by gaps in the Cascade Range (Oregon–Washington), the Sierra Nevada Range (California), and the Peninsular Ranges (from Southern California to Baja California). Specifically, this study identified five major pathways, including: 1) the Columbia River basin, which is a conduit for moisture to reach eastern Washington, northern Idaho, and western Montana; 2) a surprising path from central and Northern California, north of the high Sierra Nevada, and then north into eastern Oregon and Idaho, into the mountains of central Idaho and along the Snake River plain; 3) a path to the north and south of the high Sierra Nevada into Nevada; 4) a path just south of the Sierra Nevada into portions of Utah, Colorado, and Arizona; and 5) flow centered over gaps in the Peninsular Ranges near the United States–Mexico border and over the southern portion of the peninsula that has relatively low topography, bringing moisture into Arizona and western New Mexico. These pathways are consistent with recent studies of the penetration of atmospheric rivers into the IMW.

Although topography clearly influences the moisture transport and precipitation in the IMW, it is large-scale atmospheric patterns that create the conditions necessary for heavy winter precipitation to occur.

Expected publication date: June 2015

Modeling the effect of invasive quagga mussels on the spring phytoplankton bloom in Lake Michigan

Journal of Great Lakes Research

M. Rowe, E. J. Anderson, J. Wang, H. A. Vanderploeg (OAR/GLERL)



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- Researchers from CILER and GLERL applied the Finite-Volume Coastal Ocean Model (FVCOM) coupled with a biophysical model to test whether the observed reduction in spring phytoplankton bloom after 2004 was caused by direct, local effects of quagga mussel grazing.
- The results from the biophysical model simulations show that the direct effects of invasive mussel filter feeding can account for the disappearance of the spring phytoplankton bloom when the water column is vertically well mixed, allowing mussel access to their food supply.
- This research helps to strengthen our understanding of the complex linkages between the biological and physical components of the Lake Michigan ecosystem that is needed to advance the management of the fishery and ecosystem in the presence of invasive mussels.

Observations from the Great Lakes Environmental Research Laboratory's (GLERL) Long-Term Research (LTR) program in Lake Michigan indicate that during the period of 2000-2005 in southern Lake Michigan, the spring phytoplankton bloom plummeted in concurrence with the rapid expansion of filter-feeding quagga mussels. The results further indicate that strong reductions occurred in phytoplankton abundance at the intermediate depth of 45 meters, a zone where quagga mussel biomass is higher and the spring phytoplankton bloom has historically been concentrated. Also demonstrated from the model simulations is that with the onset of increased summer temperatures and resulting stratification of the water column, the direct local effects of mussel feeding cannot account for observed reductions in phytoplankton. Scientists infer that during periods of stratification and lack of mixing, the benthic mussels are cut off from their food supply. This research also is testament to the value of long term observational data (as collected by GLERL's Long-term research project) coupled with modeling tools, such as FVCOM, to strengthen our understanding of the interrelationships of the Great Lakes ecosystem and how these relationships can be disrupted by stressors, such as invasive species.

Expected publication date: Late summer 2015

NMFS Publications

Spatial and isotopic niche partitioning during winter in chinstrap and Adélie penguins from the South Shetland Islands
Ecosphere (2.595)

J. T. Hinke (NMFS/SWFSC), M. J. Polito, M. E. Goebel (NMFS/SWFSC) S. Jarvis, C. S. Reiss (NMFS/SWFSC), S. R. Thorrold, W. Z. Trivelpiece (NMFS/SWFSC), and G. M. Watters (NMFS/SWFSC)



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- Tracking data revealed a much larger area of habitat utilization for chinstrap penguins than previously recognized, including much of the Pacific sector between the ice edge and the 2 deg C isotherm.
- Basic scale movement may be estimable with stable isotope analysis of feather tissue, enabling population-level tracking.
- Confluence of the Weddell and Scotia Seas were identified as an area of overlap that may help guide marine spatial planning efforts in the Antarctic Peninsula region.

Closely related species with similar ecological requirements should exhibit segregation along spatial, temporal, or trophic niche axes to limit the degree of competitive overlap. For migratory marine organisms like seabirds, assessing such overlap during the non-breeding period is difficult because of long-distance dispersal to potentially diffuse foraging habitats. Miniaturization of geolocation devices and advances in stable isotope analysis (SIA), however, provide a robust toolset to quantitatively track the movements and foraging niches of wide ranging marine animals throughout much of their annual cycle. We used light-based geolocation tags and analyzed stable carbon and nitrogen isotopes from tail feathers to simultaneously characterize winter movements, habitat utilization, and overlap of spatial and isotopic niches of migratory chinstrap (*Pygoscelis antarctica*) and Adélie (*P. adeliae*) penguins during the austral winter of 2012. Chinstrap penguins exhibited a higher diversity of movements and occupied portions of the Southern Ocean from 138°W to 30°W within a narrow latitudinal band centered on 60°S. In contrast, all tracked Adélie penguins exhibited smaller-scale movements into the Weddell Sea and then generally along a counter-clockwise path as winter advanced. Inter-specific overlap during the non-breeding season was low except during the months immediately adjacent to the summer breeding season. Intra-specific overlap by chinstraps from adjacent breeding colonies was higher throughout the winter. Spatial segregation appears to be the primary mechanism to maintain inter- and intra-specific niche separation during the non-breeding season for chinstrap and Adélie penguins. Despite low spatial overlap, however, the data do suggest that a narrow pelagic corridor in the southern Scotia Sea hosted both chinstrap and Adélie penguins for most months of the year. Shared occupancy and similar isotopic signatures of the penguins in that region suggests that the potential for inter-specific competition persists during the winter months. Finally, we note that SIA was able to discriminate eastward versus westward migrations in penguins, suggesting that SIA of tail feathers may provide useful information on population-level distribution patterns for future studies.

Publication Date: May 1, 2015



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A high-resolution acoustic imaging system to map interior fish morphology
Marine Technology Society Journal (0.678)

D. Chu (NWFSC); M. Jech (NEFSC); S. Tomich (NWFSC); L. Hufnagle (NWFSC)

- The system has promise for providing morphological information on anatomical structures of fish, which are useful for improving acoustical scattering models of fish.

An Acoustic Imaging Microtome System (AIMS) was constructed to map the internal structure of fish. The system consists of two pairs of high-frequency (4.5 MHz) transmit and receive planar arrays, with one pair in the vertical plane and the other in the horizontal plane. AIMS provides a series of acoustic images, analogous to microtome slices, along the length of a fish by combining electronically controlled sequential acoustic transmissions and receptions over 224 channels and a computer-controlled mechanical device that moves the acoustic arrays lengthwise along the fish. AIMS measures the acoustic attenuation (extinction) along the direct ray paths of each transmit/receive channel pair that penetrates the fish body in a bistatic configuration. This results in a 2-D image of the interior morphology with 4-5 mm resolution. The images can provide morphological information on the fish's cheekbone, backbone, rib bone, skull, fins, stomach, and swimbladder, which is important for accurately modeling fish acoustic target strength, especially for non-swimbladder-bearing fish species. Expected publication date: May, 2015

Aquatic animal telemetry: a window into the underwater world
Science (31.48)

N. E. Hussey, S. T. Kessel, K. Aarestrup, S. J. Cooke, P. D. Cowley, A. T. Fisk, R. G. Harcourt, K. N. Holland, S. J. Iverson, **J. F. Kocik (NEFSC)**, J. E. Mills Flemming, F. G. Whoriskey

- Aquatic telemetry undergone technical advances allowing studies at local to global scales
- Novel study designs and data sharing across global networks has yielded unexpected migration patterns and movements
- new approaches to data governance, storing, and sharing needed to maximize potential and better manage cross boundary stocks

The distribution of aquatic organisms across space and time structures our marine, freshwater, and estuarine ecosystems. Over the past decade, technological advances of telemetry have transformed our ability to observe animals as they behave and move through their underwater world. These advances are now providing unprecedented ecological insights by connecting animal movements



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with measures of their physiology and environment. This is revolutionizing the scope and scale of questions that can be asked about the causes and consequences of movement and is redefining how we view and manage individuals, populations, and entire ecosystems. The next advance in aquatic telemetry will be the development of a global collaborative effort to facilitate infrastructure, data sharing, and large-scale studies not currently possible.

Expected publication date: April-May, 2015

Evolution of social capital and economic performance in New England in harvest cooperatives

Marine Resource Economics (1.159)

D. Holland (NWFSC), P. P. da Silva (NEFSC), and A. Kitts (NEFSC)

- The authors evaluate the effect of social capital on the success of new harvest cooperative management systems on the U.S. Northeast Multispecies Groundfish Fishery.
- The relationship between social capital and economic performance strengthened through time.

In 2010 a new management system based on harvest cooperatives called “sectors” was implemented in the U.S. Northeast Multispecies Groundfish Fishery. The authors hypothesize that success of individual sectors might depend on their social capital. Sector members were surveyed prior to the implementation of the policy to develop baseline measures of social capital and again after the sectors had been operating for three years. The authors constructed indices of bonding, bridging and linking social capital, information sharing, and trust and explored how these social capital indicators changed since the implementation of harvest cooperatives. They also evaluated the relationship between these social capital indicators and various measures of each sector’s economic performance. Profitability was associated with broader community and fishery-wide connections as well as bonding social capital within sectors. The result suggests that the relationship between social capital and economic performance strengthened over time.

Acceptance date: April 2015

Coastal upwelling fronts: a key habitat for albacore tuna (Thunnus alalunga) in the northeast Pacific Ocean

Progress in Oceanography (3.986)

K. Nieto, Y. Xu, S. L. H. Teo (NMFS/SWFSC), S. McClatchie (NMFS/SWFSC), and J. Holmes



NOAA SCIENTIFIC PUBLICATIONS REPORT

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- Scientists tested the effects of sea surface temperature (SST) fronts and other environmental variables on the distribution of albacore tuna (*Thunnus alalunga*) catches in coastal areas of the Northeast Pacific Ocean.
- Albacore catch per unit efforts (CPUEs) were higher near warm, low chlorophyll oceanic waters, and near SST fronts.
- Spatial distributions of model-predicted albacore CPUE were similar to observations, but the model was unable to predict very high CPUEs in some areas.
- These results help to explain previously observed variability in albacore CPUE and will likely help improve international fisheries management in the face of environmental changes.

The authors used satellite sea surface temperature (SST) data to characterize coastal fronts and then tested the effects of the fronts and other environmental variables on the distribution of the albacore tuna (*Thunnus alalunga*) catches in the coastal areas (from the coast to 200 nm offshore) of the Northeast Pacific Ocean. A boosted regression tree (BRT) model was used to explain the spatial and temporal patterns in albacore tuna catch per unit effort (CPUE; 1988-2011), using frontal features (distance to the front and temperature gradient), and other environmental variables like SST, surface chlorophyll concentration (chlorophyll), and geostrophic currents as explanatory variables. Based on over two decades of high-resolution data, the modeled results confirmed previous findings that albacore CPUE distribution is strongly influenced by SST and chlorophyll at fishing locations as well as by distance of fronts from the coast, albeit with substantial seasonal and interannual variation. Albacore CPUEs were higher near warm, low chlorophyll oceanic waters, and near SST fronts. We performed sequential leave-one-year-out cross-validations for all years and found that the relationships in the BRT models were robust for the entire study period. Spatial distributions of model-predicted albacore CPUE were similar to observations, but the model was unable to predict very high CPUEs in some areas. These results help to explain previously observed variability in albacore CPUE and will likely help improve international fisheries management in the face of environmental changes.

Expected publication date: June 2015

Fin whale (Balaenoptera physalus) global distribution in the post-whaling era (1980 to 2012)

Mammal Review (3.919)

E. F. Edwards (SWFSC/MMTD), C. Hall, T. J. Moore (SWFSC/MMTD), C. Sheredy, and J.V. Redfern (SWFSC/MMTD)



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- Seasonally-stratified maps of global fin whale distributions during the post-whaling era show an equatorial hiatus between their temperate and polar ranges in the Northern and Southern Hemispheres, suggesting that fin whales do not make the long-range, seasonal migrations into tropical regions that are typical of other large baleen whales (i.e., blue and humpback whales).
- Although changes in abundance can be seen between the higher and lower latitudes within their temperate and polar ranges, fin whales occupy many regions during all seasons, which suggests a need for year-round management considerations.
- Important geographic and temporal data gaps remain regarding fin whale distribution, range, and population structure in the post-whaling era.

The global range of fin whales (*Balaenoptera physalus*) is not fully understood. Existing range maps can be divided into two conflicting categories: one showing a continuous global distribution and another showing an equatorial hiatus (distribution gap) between approximately 20°N-20°S. Questions also remain about the seasonal distribution of fin whales. To explore the potential equatorial hiatus and seasonal distribution patterns, the authors synthesized information on fin whale distribution in the post-whaling era (1980-2012) from published literature, publicly available reports, and studies conducted by various organizations. They created four seasonally-stratified maps for line-transect density estimates, line-transect survey effort, acoustic detections, and sightings. An equatorial hiatus in fin whale distribution during the post-whaling era is supported by numerous line-transect surveys and a rarity of equatorial acoustic detections and sightings, and is corroborated by whaling era reports, morphological analyses, and genetic analyses. The synthesis of post-whaling era data is consistent with results from other studies, indicating fin whales are more abundant at higher latitudes during warmer months and more abundant at lower latitudes (although these latitudes are still greater than 20°) during colder months. However, this synthesis and results from other studies also indicate that some fin whales remain in higher latitudes (above 50°-60°) during colder months and in lower latitudes (to approximately 20°-30°) during warmer months in both hemispheres, indicating that seasonal fin whale movements are different than the seasonal migrations of blue and humpback whales. The authors' maps of global fin whale distribution provide a comprehensive picture of current knowledge and highlight important geographic and temporal data gaps. Conducting surveys within the identified data gaps is needed to increase fine-scale spatial and temporal knowledge of distribution patterns, improve fin whale taxonomy, and identify areas of elevated fin whale densities that may require management of threats, such as ship strikes.



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Expected publication date: October 2015

Modeling larval transport and settlement of pink shrimp in south Florida: Dynamics of behavior and tides

Marine and Coastal Fisheries Dynamics, Management, and Ecosystem Science
(1.810)

M. M. Criales, L. M. Cherubin, and **J. A. Browder (NMFS/SEFSC/Miami)**

- A biophysical modeling approach was used to investigate the influence of spawning location, larval traits, time of year, and physical forces on larval migration from spawning grounds to nursery grounds near Florida Bay.
- Such modeling might be used to assess stock status or interpret assessment results for relevant fisheries.
- Information derived from this research might also assist in fisheries management.

A biophysical modeling approach was used to investigate the influence of spawning location, larval traits, time of year, and physical forces on larval migration from spawning grounds on the outer southwest Florida shelf (SWFS) to nursery grounds in and near Florida Bay. A Regional Oceanic Modeling System (ROMS) based on tides, air-ocean fluxes, and freshwater flows was used to simulate the SWFS oceanography, and the Connectivity Modeling System (CMS) was used to release larvae at selected sites, simulate larval vertical movement behavior, and track resulting larval trajectories. Migration paths and recruitment success differed substantially between the two release areas and between summer and winter during the modeled years (1995-1997). Results indicated that the Marquesas ground vs. the Tortugas ground was the more effective spawning ground, being 4.5 times more likely to have settlement of originating larvae.

Expected publication date: July 2015

Initiation of migration and movement rates of Atlantic salmon smolts in freshwater Canadian Journal of Fisheries and Aquatic Science (2.276)

D. S. Stich, M. T. Kinnison, **J. F. Kocik (NEFSC)**, and J. D. Zydlewski

- Smolt development, stocking location, and environmental conditions influenced initiation of hatchery Atlantic salmon emigration
- Dams had a strong effect on movement rate - movement rate increased in reaches where dams were removed, but decreased in reaches where new powerhouses were installed.
- Results can be used to target release location, thermal exposure, and timing to improve hatchery fish performance.



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Timing of ocean entry is critical for marine survival of both hatchery and wild Atlantic salmon *Salmo salar* smolts. Management practices and barriers to migration, such as dams, may constrain timing of smolt migrations resulting in sub-optimal performance at saltwater entry. We modeled influences of stocking location, smolt development, and environmental conditions on 1) initiation of migration by hatchery-reared smolts and 2) movement rate of hatchery and wild reared Atlantic salmon smolts in the Penobscot River, Maine USA from 2005 through 2014 using acoustic telemetry data. We also compared movement rates in free-flowing reaches to reaches with hydropower dams and head ponds. We compared movement rates before and after 1) removal of two main-stem dams and 2) construction of new powerhouses. Initiation of movement by hatchery fish was influenced by smolt development, stocking location, and environmental conditions. Smolts with the greatest gill Na/K-ATPase (NKA) activity initiated migration 24 hours sooner than fish with the lowest gill NKA activity. Fish with the greatest cumulative thermal experience initiated migration 5 days earlier than those with lowest cumulative thermal experience. Smolts released furthest from the ocean initiated migration earlier than those released downstream, but movement rate increased by 5-fold closer to the ocean, indicating behavioral trade-offs between initiation and movement rate. Dams had a strong effect on movement rate. Movement rate increased from 2.8 km/hr to 5.4 km/hr in reaches where dams were removed, but decreased from 2.1 km/hr to 0.1 km/hr in reaches where new powerhouses were constructed. Movement rate varied throughout the migratory period, and was inversely related to temperature. Fish moved slower at extreme high or low discharge. Responses in fish movement rates to dam removal indicate the potential scope of recovery for these activities.

Expected publication date: May-June 2015

Fauna crime: elucidating the potential source and introduction history of European smelt (Osmerus eperlanus L.) into Lake Storsjoen, Norway

Conservation Genetics ()

M. Hagenlund, K. Østbye, K. Langdal, M. Hassve, R. A. Pettersen, **E. Anderson** (NMFS/SWFSC), F. Gregersen, K. Præbel

- The main aim of this study was to infer the most likely source (s) of the invading smelt by using microsatellite markers, and subsequently to infer its introduction history.
- The results indicated that the smelt is most likely a result of introduction from the large Lake Mjøsa, and that the translocated smelt comprise a large number of individuals.



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- This study demonstrates the utility of genetic data to determine the source of illegally introduced nuisance species.

The ability to accurately determine the original source of invading species offers several powerful applications in invasive species ecology and management and may enable important information on the invading species in its native habitat. Lake Storsjøen in South-Central Norway was recently found to have been subjected to an illegal translocation of the European smelt (*Osmerus eperlanus*). The smelt in Lake Storsjøen showed no significant genetic bottleneck effect. However, a corresponding significant test for a recent population expansion indicates that the smelt has had a high reproductive success and population growth in its new environment. The results from this study illustrate the usefulness of applying multilocus genetic markers for inferring origin of translocated populations, demographic events and introduction histories comprising an effective tool for assessment of invasive species.

Accepted: April 2015

Solar zenith angles for biological research and an expected catch model for diel vertical migration patterns that affect stock size estimates for longfin inshore squid, Doryteuthis pealeii

Canadian Journal of Fisheries and Aquatic Sciences (2.276)

L. D. Jacobson, L. C. Hendrickson and J. Tang, (NMFS/NEFSC)

- The authors used zenith angles to quantify diel vertical migration effects on both the probability of a positive tow and catch size for longfin squid using two-stage GAM models.
- Zenith angles were better than time-of-day for modeling diel effects on inshore longfin squid.
- Zenith angles could be a new tool for interpreting survey data and swept area stock size estimates used to manage fisheries.

Solar zenith angles are useful in diel studies because they are directly related to potential solar irradiance at the point of sampling and can be calculated from location, date and time-of-day. Zenith angles were better than time-of-day for modeling diel effects on inshore longfin squid (*Doryteuthis pealeii*) bottom trawl survey catches and are particularly suitable for data collected over large areas and extended time periods. The authors used zenith angles to quantify diel vertical migration effects on both the probability of a positive tow and catch size for longfin squid using two-stage GAM models. Diel effects were size specific in most cases. The authors expected catch method can be used to account for diel effects when estimating swept-area stock size from research survey data. Differences in observed day-night catches and model results show the potential for bias in swept-



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area stock size estimates that ignore diel migration effects. Zenith angles may be useful in specifying prior distributions for survey catchability parameters in stock assessment models.

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Characterizing toxic activity from Heterosigma akashiwo: a tale of two assays

Proceedings of the 16th International Conference on Harmful Algae (NA)

V. L. Trainer, L. Moore, **B. T. Le Eberhart**, **B. D. Bill**, W. P. Cochlan, M. L. Wells, **J. P. Incardona**, **T. L. Linbo**, C. G. Trick (NMFS/NWFSC)

- In this study, two laboratory tests were used to characterize *H. akashiwo* toxicity - a modified rainbow trout gill cell assay and embryonic and larval zebrafish exposures.
- In summary, the non-labile toxin from *H. akashiwo* is a largely intracellular, polar organic compound that causes impairment of cardiac function in fish, possibly through impacts on cellular Ca²⁺ homeostasis.

Blooms of the raphidophyte, *Heterosigma akashiwo* Hada (*Sournia*) have caused severe economic damage to fish farms in the inland waterways of Washington State, USA, and British Columbia, Canada and are believed to be increasing in frequency and severity. The gill assay demonstrated that the *H. akashiwo* toxin is primarily intracellular, highly soluble in methanol and ethyl acetate, and pH stable, with no loss of activity upon storage at -20°C. Stationary phase extracts from *H. akashiwo* culture were used to characterize the toxin's specific cellular targets on the development of zebrafish. At 48-hour postfertilization (hpf), intrinsic and specific effects to cardiomyocytes included reduced heart rate and atrial dilation, leading to pericardial edema. Zebrafish heart chambers formed normally, suggesting that the *H. akashiwo* toxin does not affect early cardiac development but is a physiological poison. In summary, the non-labile toxin from *H. akashiwo* is a largely intracellular, polar organic compound that causes impairment of cardiac function in fish, possibly through impacts on cellular Ca²⁺ homeostasis.

Expected publication: Fall 2015

NOS Publications

Identifying historic satio-temporal cyanobacteria biomass in western Lake Erie
Toxins (2.480)

T. Wynne and R. Stumpf (NOAA/NCCOS)

- Gives an idea when blooms start, where they are likely to progress next and likely cessation times.



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MAY 27, 2015

- The methods used here give an approximation of the spatiotemporal cyanobacterial quantification for western Lake Erie.
- In 2015, the European Space Administration is planning on launching the replacement for MERIS, the Ocean Colour Land Imager (OLCI) sensor, on board the Sentinel-3 satellite.
- The accumulation of data will lead to increased statistical power of the frequency maps and allow for evaluation of them as tools for predicting bloom position and timing. The frequency information can allow managers to anticipate the timing of the arrival and duration of the bloom in their area when the seasonal forecast is made. This information allows planning for sampling, supplies and resources, and strategic monitoring to protect public health.

Lake Erie, the world's tenth largest freshwater lake by area, has had recurring blooms of toxic cyanobacteria for the past two decades. These blooms pose potential health risks for recreation and impact the treatment of drinking water. Understanding the timing and distribution of the blooms may aid in planning by local communities and resource managers. Satellite data provide a means of examining spatial patterns of the blooms. Data sets from MERIS (2002–2012) and MODIS (2012–2014) were analyzed to evaluate bloom patterns and frequencies. The 13 years of composites were used to determine frequency of presence of both detectable cyanobacteria and high risk ($>100,000$ cells mL^{-1}) blooms. The bloom season according to the satellite observations falls within June 1 and October 31. Maps show the pattern of development and areas most commonly impacted during all years (with minor and severe blooms). Frequencies during years with just severe blooms (minor bloom years were not included in the analysis) were examined in the same fashion. With the annual forecasts of bloom severity, these frequency maps can provide public water suppliers and health departments with guidance on the timing of potential risk.

Acceptance date: April 30, 2015

OTHER REPORTS, BOOK CHAPTERS, AND INTERNAL PUBLICATIONS

NMFS PUBLICATIONS

Correspondence RE: Muñoz et al. Adaptive potential of a Pacific salmon challenged by climate change

Nature Climate Change ()

N. J. Mantua, (NMFS/SWFSC), **L. G. Crozier** (NMFS/NWFSC), T. E. Reed, D. E. Schindler, and **R. S. Waples** (NMFS/NWFSC)



NOAA SCIENTIFIC PUBLICATIONS REPORT

MAY 27, 2015

- This is a Letter in response to the Munoz et al. article listed in the title
 - Heterogeneity in habitat and genetics will produce more resilience in salmon ecosystems than Muñoz *et al.* suggest.
 - Enabling adaptation by maintaining genetic, life-history, and habitat options are practical actions that can be managed for now and which offer the possibility of maintaining long-term resilience to both natural and anthropogenic climate changes.

Summary of the letter: Muñoz *et al.* present some interesting and valuable experimental data about physiological responses of Chinook salmon to changes in developmental temperature. However, we raise concerns about their extrapolation from a small study into broad conclusions about vulnerability of the entire species to climate change. We are also concerned that this study ignored the documented capability of salmon to respond to environmental change with plastic and evolutionary changes in behavior, such as upstream (adult) and downstream (juvenile) migration timing.

Changes in phenology, rather than physiological tolerances, provide greater capacity for resilience to climate change in salmon and other taxa more generally, although the two clearly interact and the relative importance of behavioral and physiological responses may vary across taxa or contexts (e.g., geographic locations). We believe the impacts of future climate warming on Pacific salmon will be mixed, and context dependent.

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